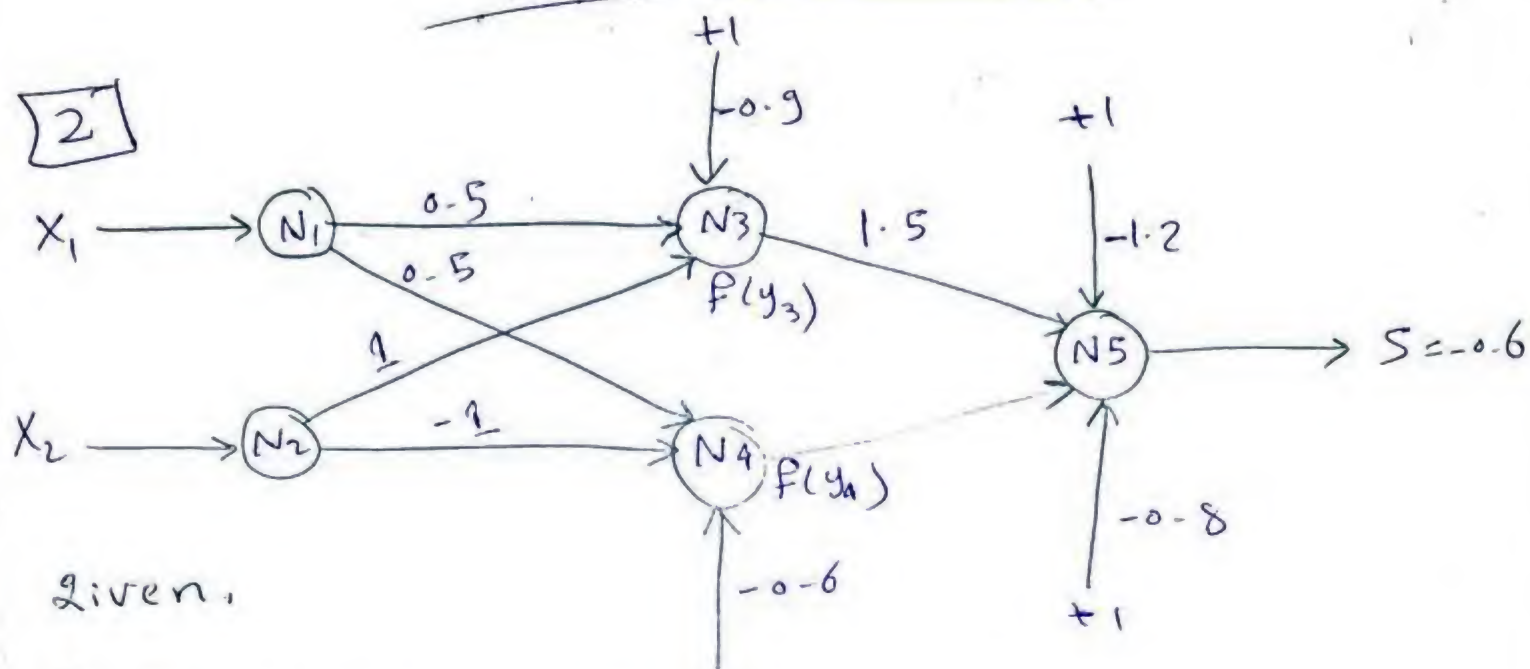


Neural - sec 5

2



given,

$N_3, N_4 \rightarrow$ binary sigmoidal

N_5 : bipolar sigmoidal ($f(y_4) = 2f(y_3)$)

5.1

$$y_5 = \ln \left[\frac{1 + 2(y_5)}{1 - 2(y_5)} \right] = -1.386$$

$$y_5 = 1.5 f(y_3) - 1.5 f(y_4) - 1.2 = -1.386$$

$$1.5 f(y_3) - 3 f(y_4) - 1.2 = -1.386$$

$$f(y_3) = 0.124, \quad f(y_4) = 0.248$$

$$y_3 = \ln \left[\frac{f(y_3)}{1 - f(y_3)} \right] = -1.955$$

$$y_4 = \ln \left[\frac{p(y_4)}{1 - p(y_4)} \right] = -1.109$$

$$y_3 = 0.5x_1 + x_2 - 0.9 = -1.955 \rightarrow \textcircled{1}$$

$$y_4 = 0.5x_1 - x_2 - 0.6 = -1.109 \rightarrow \textcircled{2}$$

$$\begin{aligned} x_1 &= -1.364 \\ x_2 &= -0.373 \end{aligned}$$

← solve $\textcircled{1}$ & $\textcircled{2}$

II $h(\alpha x) = \tanh(\alpha x)$
 $\alpha \rightarrow$ positive parameter

$$a) h(\alpha x) = \frac{2}{1 + e^{-2\alpha x}} - 1$$

$$b) \frac{d[h(\alpha x)]}{dx} = \alpha [1 - h^2(\alpha x)]$$

$$c) \frac{d[h(\alpha x)]}{dx} = \alpha \quad x = 0$$

$$d) \frac{d^2[h(\alpha x)]}{dx^2} = -2\alpha^2 h(\alpha x) [1 - h^2(\alpha x)]$$

Sol

a)

$$h(\alpha x) = \frac{\sin(\alpha x)}{\cos(\alpha x)} = \frac{(e^{\alpha x} - e^{-\alpha x})/2}{(e^{\alpha x} + e^{-\alpha x})/2} \times \frac{e^{\alpha x}}{e^{-\alpha x}}$$

$$= \frac{2}{1 + e^{-2\alpha x}} - 1$$

b)

$$\begin{aligned}\frac{d}{dx}[h(\alpha x)] &= \frac{d}{dx}(\tanh(\alpha x)) = \alpha \operatorname{sech}^2(\alpha x) \\ &= \alpha [1 - \tanh^2(\alpha x)] \\ &= \alpha [1 - h^2(\alpha x)]\end{aligned}$$

c)

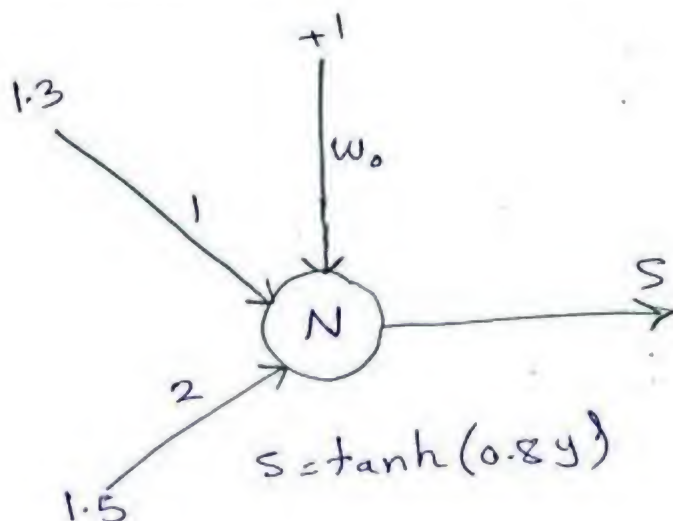
$$\frac{d}{dx}[h(\alpha x)]_{\max} \Rightarrow \frac{d}{dx}[\tanh(\alpha x)] = \alpha \operatorname{sech}^2(\alpha x) = \alpha [1 - \tanh^2(\alpha x)] = \alpha (1 - h^2(\alpha x))$$

$$\frac{d^2}{dx^2}[\tanh(\alpha x)] = \alpha^2 [-2 \tanh(\alpha x) \operatorname{sech}^2(\alpha x)]$$

2

a) $w_0 = -2.5$ Find s

b) $s = 0.71$ Find w_0



$$y = 1.3 + 3 + w_0 = 4.3 + w_0$$

a) $w_0 = -2.5$

$$y = ~~4.3~~ 4.3 - 2.5 = 1.8$$

$$s = \tanh(0.8 \times 1.8) = ~~0.894~~ 0.894$$

b) $s = 0.71 = \tanh(0.8y)$

$$y = 1.109$$

$$y = 4.3 + w_0 = 1.109$$

$$w_0 = -3.191$$

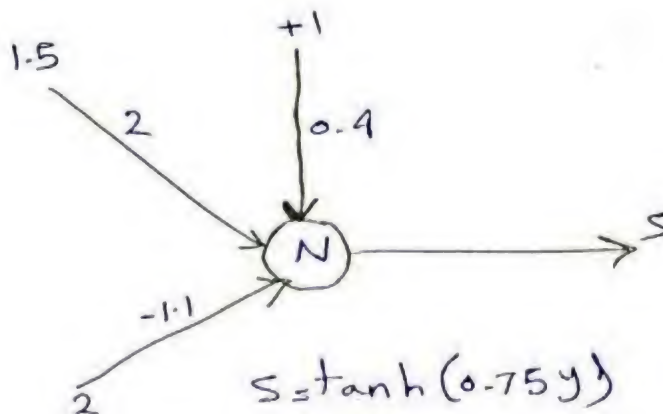
5

3

a) $s = \tanh(0.75y)$

$y = 1.2$

$s = 0.716$

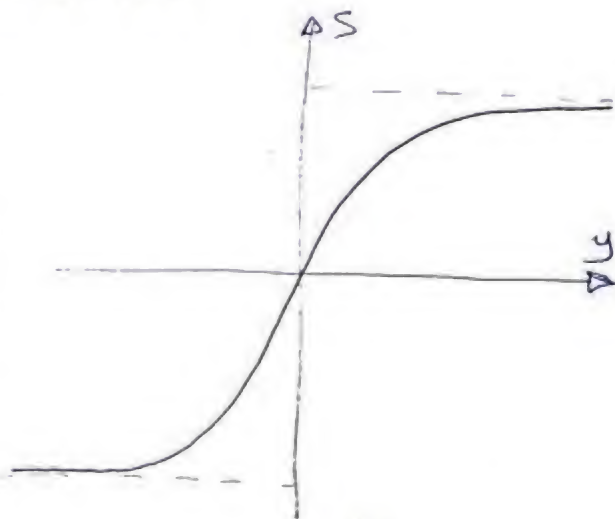


b) $\frac{ds}{dy} s \propto \text{sech}^2(\alpha y) = 0.75 \text{sech}^2(0.75 * 1.2)$
 $= 0.366$

c)

s:

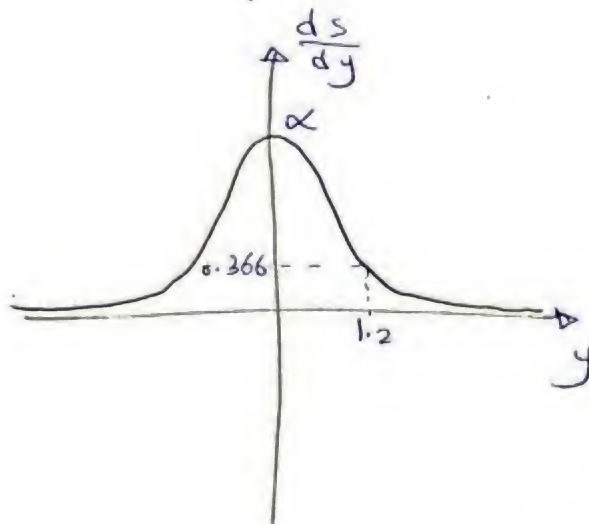
y	-2.5
s	-0.954



d)

$\frac{ds}{dy}$

y	-----
$\frac{ds}{dy}$	-----

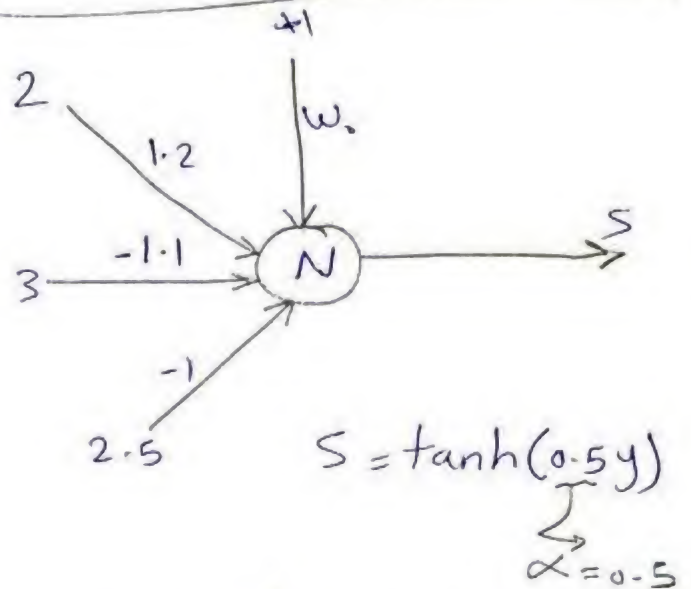


6

e) $\max \longrightarrow y$

$$y = 0 \quad \max. = 0.75$$

Find $w_0 \rightarrow \frac{ds}{dy} = 0.226$
 $y = s$



$$y = -3.4 + w_0$$

$$\frac{ds}{dy} = \alpha \operatorname{sech}^2(\alpha y) = 0.5 \operatorname{sech}^2(0.5y) = 0.226$$

$$= 0.5 (1 - \tanh^2(0.5y))$$

$$y = \pm 1.9$$

a) $y = 1.9 \Rightarrow w_0 = 5.3$

$$s = \tanh(0.5y) = +0.74$$

b) $y = -1.9 \rightarrow w_0 = 1.5$

$$s = -0.74$$